

Dec 77

President's Corner

Our hobby is about to experience another technical leap forward, even more important than the change from tubes to transistors. The far reaching effects have not really begun yet, but they will affect all of us. Ham Radio is going to experience an explosive period of growth, similar to CB. What will be the stimulus that will invert present day Amateur Radio? The orbiting of the Phase Three Oscar!

Do you, the average Ham, grasp the promise and potential of Oscar? Our assigned frequencies above 50 MHz are huge; why we could stuff every licensed station into one corner without QRM! With the elliptical orbit and design capabilities of Phase Three Oscar, a new 20 Meter band will open. For between 12 and 15 hours each day, half of the world will be open to operators with low power, small antennas, and quieter band conditions. Think of the potential! Satellites for FM, TV, SSB, FAX, RTTY, ect. each band could have one satellite for each mode. This reality is no technological daydream. Its something that will be accomplished.

How will this affect us? The technician's license is earned by passing 5 WPM (1A) and a written test (E3). Suddenly that's all you need to talk to the entire world. Our ranks will grow and grow, with the kind of problems found in the Old West gold mining camps.

You must decide NOW that you're going to lend your talents, skills, and operations know how. A small cadre of sergeants created a fighting army out of civilians in WW II. Mobilization of the experienced Hams must take place on a grass roots level. If you choose to ignore the new Hams, you will have no one to blame but yourself when the LIDS outnumber the gentlemen on Amateur bands.

WA1SNJ
Jeff

ZERO BEAT Issue 12

Pres	Jeff Duquette	WA1SNJ	569-6739
V.Pres	Bruce Felner	WA1PUX	567-7240
Treas	Steve Shure	WA1ZEV	567-7954
Sec	Larry Soltz	WB1CJH	567-3444
OBeat	Bob McCormick	WA1QHR	562-5767

Next Meeting
Friday, December 2, 1977 7:00 PM
Spaghetti Supper
Westfield YMCA
68 Court Street
Westfield, Ma.

December Spaghetti Supper

This is Ham Radio is the theme of the December Meeting. If you haven't heard or don't know, we will be having a spaghetti supper at the Westfield YMCA, 67 Court Street, Westfield, Ma. 01085 from 6:00PM to 7:30PM. The radio program begins at 8:00PM. Supper tickets are \$2.00 in advance and \$3.00 at the door. Get your tickets early, there will be a limited number available. See any club officer for tickets. You can attend just the radio program at 8:00PM. It will consist of 10 minute talks on things like Homebrewing, MARS, ARES, Oscar, etc. A fun evening of Ham Radio. Don't miss it!

Comprehensive Code Tests

The FCC now sends the code and you have to answer questions about what was sent. You no longer have to copy one minute solid nor do any sending to pass. (Except Novice.)

What does the test sound like? Well, first they send one minute of practice then six V's, then you must copy what is sent to answer 8 out of 10 questions correctly. The following is very similar to their test. Caps mean they are going to ask about it.

VVV VVV W2MN de WB7XLY rrr fb om ur rst is 579 and my qth is MONTE, COLORADO and weather here is COLD and WET and my rig here is the GALAXY 500 with 14 TUBES and antenna is a 3 ELEMENT YAGI up 40 meters and i have an ADVANCED license for the past 11 YEARS i usually work on the 75 and 15 meter bands. i have a daily schedule with G5PV in BRINGHAM on 40 meters and i am an ELECTRICIAN at GENERAL DYNAMICS for the past 30 years. so hw cpy? W2MN de WB7XLY AR.

A typical question would read:

His rig was a:

- a. Gantrez with 14 tubes.
- b. Galaxy with 13 tubes.
- c. Gelex with 15 tubes.
- d. Galaxy with 14 tubes.
- e. Galaxy with 12 tubes.

So its much easier but about 75 percent are still failing it. Practice listening to WIAW is still the best. It does not hurt you to try to pass the 13 WPM for General. They'll still let you go for the Technician. Good Luck and let Zero Beat know when you pass!

11 Meter Antenna Tips

1. Two bags of cement is more than enough for the base of the tower.
 2. Guy wires aren't really needed, but don't waste your money. Number 30 wire will hold it for sure.
 3. The rotor should be heavy duty enough to turn the largest omni-antenna.
 4. Make sure the DX fluid hasn't dried out in the antenna!
- Tnx to Griffy WA1VON

Meetings Schedule

14 Dec

02-Dec	Spaghetti dinner at the Westfield YMCA and radio program starting at 8:00PM.
07-Jan	Ham Radio Horizon's editor Tom McMullin will speak on DX and antennas. Free copies of HRH for everyone present. The VHF weekend is this month.
Feb	ARRL speaker WA1LNQ will speak on antennas, and receiver transmitter performance. Don't miss this one!
Mar	First Aid talk on electrical shock. Steve Shore has the other half of the program. Technical film from the League.
Apr	Guest speaker not signed up yet. Organization of Field Day. Nomination of officers for next year. Technical film from League.
May	Flea Market. It will be advertised extensively. If you thought our auction was good then wait until May!
Jun	Our annual Banquet. Raffle and Door Prizes. Installation of new officers. (Do you want a guest speaker? On a radio topic? Or general interest?).

Novice Classes

We have five club members teaching classes right now. Any member who wants to teach a class, we will loan you everything you'll need. Many school's are willing to let you use the facilities free. Register your classes with Zero Beat and the ARRL to get all kinds of help and goodies!

Miscellaneous Notes

Ron Beauchemin, WB1ETS, passed his technician.....Hams are needed to present Oscar programs in area schools. Interested? Let us know.....Jeff, WA1SNJ, passed his Extra. He also put up a new beam antenna and is working Japan and other DX.....Would you be interested in going on a radio talk show to discuss Amateur Radio? WDEW in Westfield will put us on the air.....If you're teaching a

Novice class, ZB will be glad to advertise it for you.....Membership applications for the HCRA and ARRL will be made available along with free issues of Zero Beat. Just ask!.....Members who have HCRA papers or other goodies are asked to return them. We are missing a lot of items. If you know where or if we own a corporate seal, please call us. The club will have to buy one if we can't find it.....John Balboni WB1CAD is now the HCRA liason station to 34/94 with club bulletins. He will also help turn in reports to ZB on the ten meter net. The club needs everyone spreading the information on our programs.....Norm Forest, N1PF, has 21 students in his Novice course. He is going to go right onto General theory after Novice.....HCRA dues are still \$5.00. Send your money to Box 346, Southwick, Ma. 01077.....Provin Mtn club meets the first Monday of every month at the Red Cross building, 275 Maple Street, Springfield. Radio classes all other Mondays of the month. They are beginning a 10 Meter morse code net for increasing your speed. 8:00PM every Thursday on 28.175 MHz, 5 WPM.....In case of a bad storm, listen to WHYN-AM for a notice of meetings cancellation. Neither rain, nor snow, nor low muf, will keep the Hams away.....Jim Call's new call is WD6DRZ. Why not give him a call??.....The FCC will be giving Amateur exams in Hartford around January 17, 18, 19. You must apply ahead of time! Mark your 610 Form I will appear in Hartford, CT. for the test. An SASE to ZB will get you a Form 610.....The RFI/TVI committee is still in limbo. Would anyone be interested in being on it??.....The next MTARA meeting is December 19th. Its the Christmas party at the Ground Round in West Springfield. The fun starts at 6:30PM.....Technicians, you can check into the Western Mass Emergency Net that meets every Sunday morning on 3.935 kHz via most of the area repeaters. Call up is at 09:00AM on Sunday. You can join the Amateur Radio Emergency Service by passing your name and QTH to the net control.....Ozzie Ladue's new call is N1AY.....At our November meeting we raffled off two new 1977 Call Books. WA1PUX, Bruce, and W1MDM, Cal were the lucky ones.....W1JP, Bill and WA1RWU, Frank are both interested in radio controlled airplanes. Bill seems to be the only person who gets the sunny, clear days to fly.....K1KBQ, Dick, can no longer perform the duties of Publicity Officer for WMass. Is anyone else interested?.....Drop your lines for Misc Notes to Zero Beat, in care of P.O.Box 346, Southwick, Ma. 01077

Your First Time?



This is our club newsletter. We are mailing this issue out to all league members in the Western Massachusetts area. You should know that you are welcome to join our club. The HCRA has varied programs for Novices and Extras a like. We meet at the Feeding Hills Congregational Church, at the intersection of routes 187 and 57, in the centre of Feeding Hills the first Friday of every month. For December we are hosting a spashetti supper in Westfield. Please look us over, and attend some of our meetings. We want you in the club, bringing new viewpoints, experience, laffs, and friendship. We are a league affiliated club, and support the ARRL.

The ARRL Stolen Equipment Registry

To introduce you to the ARRL's Stolen Equipment Registry, we are printing a copy of the stolen equipment registration card. If you wish to report stolen equipment for listing in the ARRL Registry, you will want to use this card. Please list only one item per card.

A monthly updated list of all stolen equipment will be tabulated. This listing of stolen equipment is available upon request from the ARRL with a SASE. This service is on a one year trial basis.

Also, please note, that if your equipment is recovered, please drop a note to the Registry at the ARRL and tell them to discontinue the listing. You may do this by indicating the item number and the issue (month) that your equipment was listed in the Registry.

1. MANUFACTURER	2. MODEL	3. SERIAL #	4. DATE STOLEN Day / Month / Year
 STOLEN EQUIPMENT REGISTRY 			
5. ITEM (Check) <input type="checkbox"/> TRANSCEIVER <input type="checkbox"/> XMTR <input type="checkbox"/> RCVR <input type="checkbox"/> OTHER.....			
6. ANY IDENTIFYING MARKS			
7. YOUR NAME (Last, First, M.I.)			8. YOUR CALL
9. ADDRESS			10. STATE/PROV. ZIP
11. TELEPHONE (incl. Area Code)		12. IF LOCATED, CONTACT <input type="checkbox"/> OWNER LISTED ABOVE OR	
.....		ADR TEL (INCLUDE AREA)	

Return to: **ARRL Stolen Equipment Registry**, 225 Main St., Newington, CT 06111
Form SER 1077

Treasure's Report

Check book balance as of 01-Sep-77: \$196.42

Income:

84 Paid memberships:	\$420.00
October Auction:	\$155.15
October Coffee:	\$ 21.40
Supper Holding:	\$ 26.00
Misc Income:	\$ 23.29

Expenses:

Zero Beat mail:	\$101.89
Library Donation:	\$ 35.00
Gift Certificate:	\$ 20.00
Coffee Cups:	\$ 8.00
Rental Church:	\$ 45.00

Total Expenses: \$209.89
Balance: \$632.37

Total Income: \$842.26

Novice Corner

If you want to buy code tapes, they are available from many places. QST ads are one place to look, or the Ham Radio Magazine ads. 60 minute tapes are also available from: Royal, Box 2174, Sandusky, Ohio 44870. They are \$3.00 each or \$10.00 for 4. Specify the code speeds you want.

Finding that first riss can be a lot of trouble. Two places you might not know about are Ham Trader Yellow Sheets, A.L. Brand Publisher, P.O.Box 311, Sycamore, IL 60178. They list all types of gear for sale at the best prices. Four issues cost \$1.00. Harty's Electronics in West Hartford sells new and used Ham gear. Prices are high, though. Don't be afraid to advertise in ZB or ask a club member's opinion.

Brown Bassers

The brown bassers meet every Friday at the Ground Round in West Springfield, just over the North End bridge at the rotary. The meeting starts approximately at 11:30 and ends when we run out of food, drink, good jokes and a generous swapping of new and old information. Technical help for troubled riss and just plain good conversation and relaxation are the order of the day. All are invited to attend and join in the fun.

At this week's meeting, we welcomed W1RRW, Glen, and WA1ZKT, Paul, both new faces who stopped by for lunch. We hope to see them again soon.

They joined K1YQQ, Chet, the mad peanut bomber, W1NPL, Ed, W1GOZ, Ted, W1NQG, Wess, W1DVW, Bob, WA1WXS, Don, K1KBQ, Dick, who is one of the tireless technicians on the 40-00 repeater, WA1ORT, Ray, and WB1EMB, Joe.

Remember Brown Bassers. Every Friday for lunch. See you there!

New Members

I'd like to welcome the following new members to the ranks of the HCRA.

WB1CAD JOHN
WB1CAC SCOTT
WB1DDU DAVE
WALT WASKELEWICZ
WA1WXS DON
RAY LAUPHINAID
W1JF BILL

N1FJ FRAN
WB1EDN AL
WB1DLG LOU
WB1EMP JOE
W1PN HUGH
WA1VCU CHICK
WA1WFR LARRY

WB1BLM RUSS
WA1JUJ KEVIN
Welcome one and all!

WB1BPS KEN
WA1WTK LOU

We Are Under Attack

Jack Anderson's column from last summer has been discussed by all of us. This type of half truths and misrepresentation is the way in which the press will mis-lead the public until the FCC can ignore the Amateur community and give our frequencies over to business communications and Good Buddies. The American Radio Relay League is fighting for your frequencies and to insure the survival of Amateur Radio. You must decide now that you are going to support the League in its efforts. Waiting and delaying will mean a stronger and better organized anti-Ham lobby. As New Englanders, we must close ranks and stand together, as the embattled farmers stood on the Concord green so long ago. There they defied an officer's order to disperse at the order of a king. These farmers stood their ground and fought the world's most powerful empire. We hams only have to deal with massive public indifference, 10 million CBers, a strong industry lobby, and the FCC!

Secretary's Report

Your board of directors have been meeting every month since August. The club program for 1977 1978 has been carefully planned. Our October Auction was a success, November's Oscar program well presented, and December's banquet will be great fun. Details on our future get togethers are in this issue of ZB. Minutes of all meetings are on file and available for reading.

Larry Soltz WB1CJH

Club Call W1NY

As a result of some diligent efforts by our immediate past prez Ted, WA1GZO, the club was fortunate in being issued W1NY by the FCC in April 1976, with yours truly as an extra trustee. It may be well to recall during this season of festivities and celebrations one of our more active, founding members of the Association who became silent key in his sleep shortly after his retirement from the local gas company. Hank Baier, W1NY, 1902-1971, was first licensed in Chelsea, Ma. circa 1918 as W1KK. As a youngster he worked in the pioneer radio factory that made the famous Murdock Earphones and other vital accessories. From Murdock, Hank progressed to shipboard operator for United Fruit Lines out of Boston during which he acquired that inimitable Banana Boat swing to his cherished CW fist.

In 1926 Hank transferred to the Springfield area to begin his 44 year career as chemist for the gas company, then producing its own gas by converting coal. Hank's chemical duties phased out with the coming of the Tennessee Pipeline natural gas line at about the same time that they were introducing two way radio into his company's trucks. The writer recalls many spirited semi-technical

bull-sessions in the little red brick building near the Page Blvd. storage tank that also served as an antenna support. The gas company will probably never know that they contributed substantially to reduction of TVI in our Ham community via Hank and his instruments during those early, strenuous weak signal TV days and open chassis 10 Meter amplifiers.

Am sure that there are a number of us in the club who admired and were inspired by the Mohawk Park Field Days and church hall banquets in Wilbraham and dedicated life long interest Hank had for the Hampden County Radio Association.

In 1967 the club honored Hank with a testimonial and plaque for 50 years of Ham Radio in the public interest.

Art W1KK

Ham Helps Out

Larry Soltz has been helping two East Longmeadow residents in true Ham tradition. Mr. and Mrs. Dave Oslevy have a daughter and son-in-law living in Brazil. They wanted to talk to them and turned to Amateur Radio for help. Larry set up a schedule with a Brazilian station and invited the Oslevy's into his shack. A half hour QSO ensued between them and their daughter Barbara. You know what a heart warming experience it was to listen to grandma and 5 year old granddaughter talk to each other over the airwaves.

Larry commented that this was the first time he has worked third party traffic and his most rewarding experience in Amateur Radio so far.

November's Meeting

W1KK, Art Zavarella and W1QWJ, Dick Stephens, did an outstanding job explaining the Oscar satellite program. Antennas were set up behind the church and we attempted to hear two different passes. No luck, though! What was really exciting was hearing about what's coming next. The Japanese are sending up a satellite soon, and the Russians are supposed to put up three. Our Phase Three Oscar should go up by February 1978. With this in an elliptical orbit, with an apogee of about 20,000 KMS, you will be able to work most of the globe on low power. A new 20 Meter band will be created, with the low noise characteristics of FM.

Art and Dick explained how to track Oscars, and the different types of antennas you can use, all very cheap and easy to make yourself. The different modes, doppler shifting, and the unique vocabulary of satellites were well explained. Larry Langevin, K1GXU, our Amsat representative for Mass, brought a box of freebies along that helped explain the program. If you join Amsat, please mention Larry's name.

The league color slide show was on the construction and orbiting of Oscar 6 and 7. Art Zavarella played a tape he had made of Sputnik transmitting down from space on 07-Oct-57. It was a well presented and interesting meeting for all. K1YQQ, Chet, brought in league repeater directory's for everyone. We also raffled off two 1977 Call Books for prizes. WB1CAD, John, and WB1CAC, Scott, brought in all the projectors and tape players.

Feb Meeting Plans

On Feb third at 8:00PM at the Feeding Hills Church the Hampden County Radio Association will receive a talk by Jay Russgrove WAILNQ.

Some of you may have spoken with Jay on the air or read one of his fine articles in Q Street. As you may have guessed by now Jay works for the ARRL and will be our league speaker. His topics will include evaluating receiver and transmitter performance.

Jay Russgrove is one of the newer members at the league and not too many people have had a chance to eyeball with him. So save Feb 3rd for an interesting club meeting with speaker Jay Russgrove WAILNQ.

The Effect of Bias and Distortion on Teletype Ranges

To explain the effect of spacing bias, marking bias, and distortion, on the range of teleprinters, the selecting mechanism will be covered briefly.

The teleprinter is a start stop machine in which phasing is accomplished by stopping the receiving cams once every revolution of the shaft, and releasing them in phase with the sending cams when a start pulse is received. It may appear that the main shaft is turning continuously but it is actually starting and stopping.

The sending shaft is equipped with a set of six cams, one opens and closes the start stop contacts, and five that open and close the five intelligence contacts. When the intelligence contacts are properly adjusted, at 60 words per minute, each contact remains open or closed for a period of 22 milliseconds. The start stop contact will remain closed untill another key is depressed. When it is properly adjusted, it too will open for a period of 22 milliseconds before the leading edge of the first pulse is received. When the cam is set in motion, then, each pulse, including the start pulse, has 22 milliseconds in which to occur. This time does not change and always maintains a definite relationship to the beginning of the start pulse.

The receiving shaft carries an assembly of five cams, one for each intelligence pulse. The receiving shaft rotates slightly faster than the sending shaft, and the cam assembly is stopped at the end of each revolution and does not start again until another start pulse is received. When the start pulse is received, the cam rotates in phase with the sending cam.

The idle position of the receiving cams, with respect to their respective selection mechanism, is adjustable by means of a range scale arm. This arm has a pointer and can be swung from one end of a range scale to the other.

The scale is usually marked from 0 to 120 points. When a printer is properly adjusted, it should print, without an error between 20 and 90. Again, when all marking and spacing pulses are of the same length, it represents an unbiased signal. When all spacing pulses are of the same length but longer than normal the signal has spacing bias. When the spacing pulses are longer than 22 milliseconds, the marking pulses are shorter by an equal amount.

When all marking pulses are of the same length but longer than normal the signal has marking bias. When marking pulses are longer than 22 milliseconds, the spacing pulses are shorter by an equal amount.

When the length of the pulses vary, the signal is said to be distorted. At one time the spacing pulses will be longer in which case the range scale arm has to be moved toward 20 to correctly print, and at another time the marking pulses will be longer and the range scale arm must be moved toward 90.

Therefore, while spacing bias raises the lower end of the range to copy, and marking bias lowers the upper end; distortion on the other hand moves the range limits inward from both ends. Incoming biased signals cannot be corrected at your end, but by moving the range scale arm readable copy may be realized.

Teletype is a trademark of Teletype Corp.

Tnx to Ed, W1NPL

Net News

For those of you who don't know yet, the HCRA 10 Meter phone net meets at 8:00PM local time every Monday at 28.650 MHz. Here is the perfect opportunity to discuss club activities and ideas, pass local traffic or traffic to HCRA members as well as get together with your friends for a chat on a undisturbed QRM free band.

Checking in is easy and don't worry if you don't have a beam, as half of the net members are running dipoles, and doing FB with them.

Another reason to check in to the net is the coveted HCRA 25 Award given by the club. Every one deserves to get this beautiful piece of wall paper, and all you need to do is work 25 HCRA members, write down date and time of QSO, no QSL cards are needed for this award. So there's another reason to check into the HCRA 10 Meter phone net Monday's at 8:00PM at 28.650 MHz. C U there.

Grounding Rods

If you want to improve your ground rod, pour the old anti-freeze from your car into the ground under the rod. It is highly conductive and will evaporate. Please note that only OLD anti-freeze should be used because it is highly ionized. Ethylene Glycol is the main ingredient and is poisonous. Don't leave it in unlabeled containers. Do not pour it over plants or you'll kill them. Tnx to Griffy WA1VON.

Sweepstakes Contest

CQ CONTEST CQ CONTEST CQ CONTEST. That's what you'll be hearing on the air waves January 21st and 22nd. Its time for the VHF Sweepstakes, an annual test of operating skills. The HCRA will be in again, as we have been for all but two years since its inception in 1940. Our past scores were:

Year	Points	Place	Ops
1975	35,394	7th	11
1976	42,771	8th	10
1977	32,570	8th	22

Our 1977 score was low due to the very poor propagation. With the record breaking openings of 6 Meters this past summer we expect to really do well this year. If every club member sets on and just makes 10 contacts, with the club multipliers, they can add almost 3,000 points to our total! The HCRA will have several multi-operator stations on the air that you can work at. Equipment is available for loan if you want to set up your own station. If 6 Meters opens up, you should be able to work 48 states from Western Mass. This past summer KH6 contacts were made on Six.

Hams with the new transverters for Oscar, put them on the air. The old AM-CW tube rigs are also a lot of fun to run this weekend. Converters are available for loan so that you can copy your Ameco TX-62 with your FT-101E! Synthesized FM rigs should really be able to go to town. Whatever you own, put it on the air and make contacts.

The rules will be in the December or January Q Street. Loss will be printed in next month's ZB. Plan now to participate. Not having the equipment is no excuse, because we'll loan it to you. The antennas, coax, rotors, ect. are all available. Contact Frank or Gary Potts, Art Zavarella, or Jeff Duquette for help. Loss and other information will be at the January meetings. See you there!

Tnx Frank Potts, WA1RWU.

HCRA Crossword Puzzle Contest

Win a 1978 ARRL Handbook!

Rules

1. HCRA Members Only!
2. Decision of Judge is final. In case of tie, earliest postmark wins.
3. Must be returned to Zero Beat, Box 346 by Jan 15, 1978.
4. Sign your name on the puzzle.
5. Winner will be in Feb ZB. Everyone who has correct puzzle will also be listed. Prize awarded Feb meeting.
6. Void where prohibited by law.

Want Adds

For Sale: SB-101 with CW filter. HB-23 and SB-600 speaker. Heathkit SWR meter. Disikey keyer and paddle. Many accessories. Best reasonable offer. Contact Ed Stafanik, WA1CYK at 534-4685.

Wanted: Transistorized Oscilloscope in working cndx. Call Ed WA1CYK at 534-4685.

For Sale: Heathkit 301, 401, and SB-200 \$650.00 Mint. Few extras thrown in! Hewlett Packard frequency meter with manual. Modle 524D, 8 digit, 10 cycles to 220 mHz. \$200.00 Collins R390 with manual. \$250.00

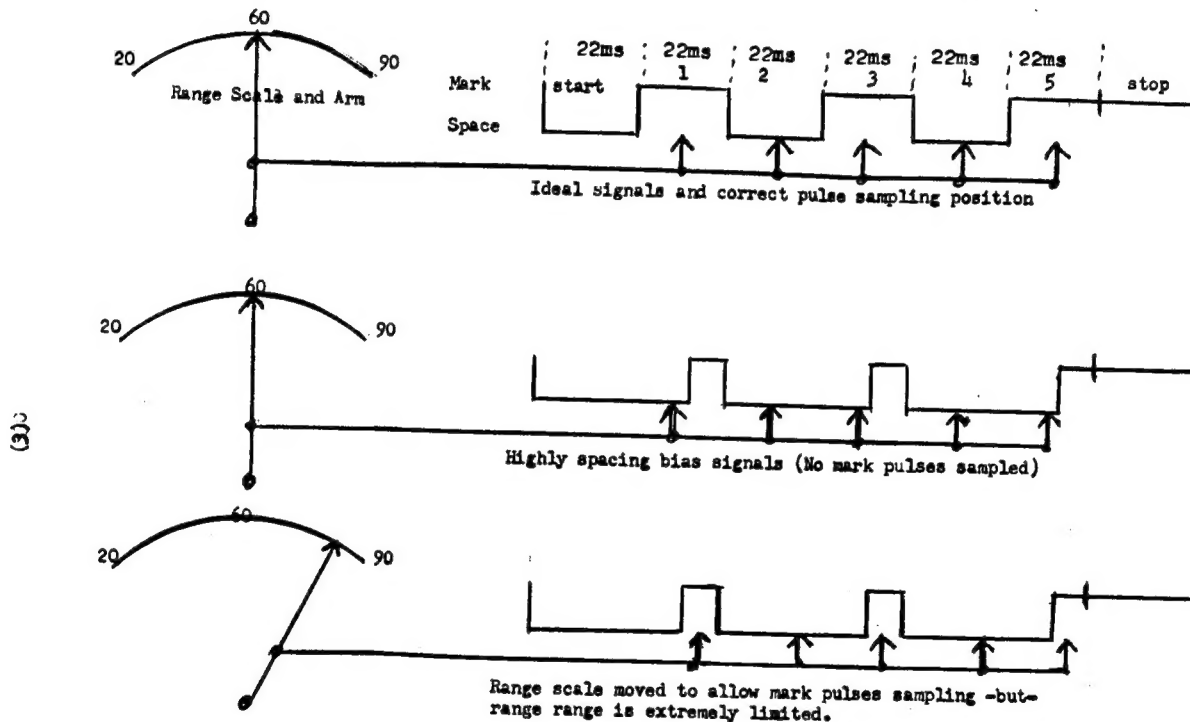
SP600JX with manual \$225.00. Mint. Antenna Tuner \$90.00. Contact Ed White, W1NPL, 136 Woodlawn Street, Chicopee Falls, Ma. 01020.

Sale: Two mikes, Sure, Model 354, good condition, \$5.00 each. Contact Joe, K1ZOL, at 783-1867.

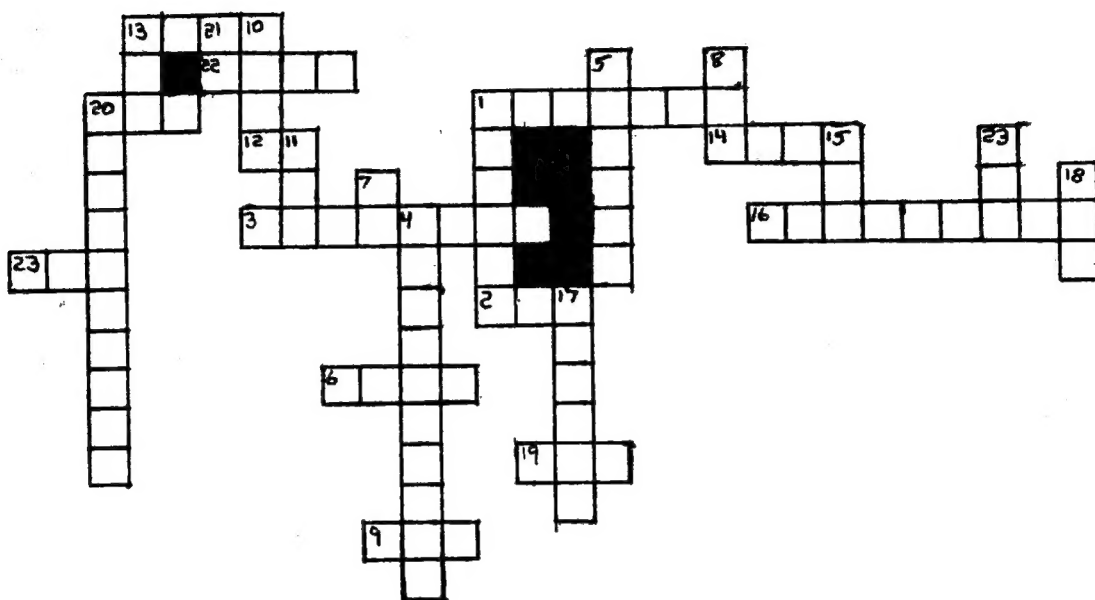
Wanted: Your add could have appeared here. If you need something or you have something you have to unload drop a line to ZB at Box 346, Southwick, Ma. 01077. Its free; you can't do any better than that!

Thanks to all who helped with articles for this months Zero Beat. It really helps make our news letter what it should be. Again, its your paper. If you have something you'd like to share set it to us and we'll print it. See you at the supper!

Ed.



Ed W1NPL



Down:

1. Isotropic
4. E3 and 1 (a)
5. Opp. Perigee
7. Contest
8. Slow cw
10. Conference in '79
11. Bureau
13. Frequency standard
15. Transistor type
17. Complete OSCAR orbit
18. Group radio
20. Ant. tuner
21. Amplitude Modulation
23. Jan. 1st, brass

Across;

1. Shift as xmtr moves
2. Ant. gain times power in
3. Radar Osc.
6. HCRA station
9. A-4
13. Hiram's call
12. "Any station"
14. DX signals
16. $\text{---} = \sqrt{R_s^2 + (X_1 - X_c)_s^2}$
19. .34/.94 Mount
20. CB'ers cause this
22. Military hams
23. League 50 award